

The Myrmeleontidae of southern Africa: tribe Palparini. Introduction and description of *Pamares* gen. nov., with four new species (Insecta: Neuroptera)

by

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A revision of the Palparini (Neuroptera: Myrmeleontidae) is commenced with an introduction to the tribe and description of *Pamares* gen. nov., with four new species, *P. parvus*, *P. nephele*, *P. damarus* and *P. deru*, from the Namib Desert of southwestern Africa. It is the fourth in a series documenting the southern African Myrmeleontidae.

INTRODUCTION

The tribe Palparini, as defined by Markl (1954), includes the largest and most striking Myrmeleontidae and also some of the most recently evolved members of the family (Mansell 1985, 1990). Wingspans range from 45 mm to 170 mm and the wings of all species are characteristically marked with black, brown or indigo, often on a yellow background, effectively camouflaging the insects when the wings are closed. Most species are nocturnal and are attracted to light. All known larvae live in sand without constructing pits and the exploitation of this vast habitat has certainly enhanced the emergence and proliferation of this great group of large ant-lions (Mansell 1990).

The tribe is confined to the Afrotropical, Oriental and southern Palaearctic Regions, with no vestige in Australia or the Americas. The Afrotropical Region has been a major evolutionary centre of Palparini, with an especially rich speciation in southern Africa where nearly half the known taxa occur.

Despite their size and abundance, the systematics of the Palparini is in a confusing and unresolved state, with numerous synonyms emanating from the indiscriminate use of insignificant characters by earlier taxonomists. In many cases descriptions are too superficial to permit identifications and several critical holotypes have been lost or destroyed, further complicating the association of published names with taxa. Nineteen genera and 223 species and subspecies have been described, but current research indicates that there are only about 100 valid species in the tribe. A detailed study of the species of Palparini is consequently a priority to determine the status of each described taxon in order to clarify the systematics of the group.

The Palparini, together with the tribes Palparidiini, Dimarini, Pseudimarini and Echthromyrmicini, comprise the subfamily Palparinae (Hölzel 1986). Stange & Miller (1990) also include the Maulini and classify the Echthromyrmicini and Palparidiini with the Dimarini and Palparini respectively. These tribes probably do not constitute a monophyletic group as the subfamily has never been adequately defined, being based on plesiomorphic characters of the wing venation (Hölzel 1986). The present revision is thus based at the tribal level which is more clearly defined. A better understanding of the constituent taxa within the tribe will eventually lead to a more precise delimitation of the subfamily.

This author's research on the Palparini has been in progress for several years (Mansell 1990) and this is the first in a series revising the tribe. The revisional series will deal with all Palparini, with emphasis on the southern African fauna. This paper introduces the tribe with an historical review of research on Palparini, a discussion of the diagnostic tribal, generic and specific features and the status of the genera. It is concluded with the description of a remarkable new genus containing four undescribed species endemic to the Namib Desert of southwestern Africa. The four comprise a group of morphologically similar small attractive diurnal Palparini, the type species being the smallest known palparine.

This contribution is the fourth in a series documenting the southern African Myrmeleontidae, the first three treating *Bankisus* Navás, *Cymothales* Gerstaecker and *Tricholeon* Esben-Petersen, in the tribe Dendroleontini (Mansell 1985, 1987, 1988).

The new genus and species are based on material in the National Collection of Insects, Pretoria, South Africa (SANC, accession code Ac.NE); South African Museum, Cape Town (SAMC); Transvaal Museum, Pretoria (TMSA); State Museum of Namibia, Windhoek, Namibia (SMWH); Entomological Museum, Lund University, Sweden (EMLS); L.A. Stange Collection, Gainesville, Florida, U.S.A (LASC). Other abbreviations are as in Figs 1–13 and principal wingveins and abbreviations are depicted in Fig. 43. All measurements are in mm: mean measurements are given, with ranges in brackets.

Tribe PALPARINI Banks

Historical review

History of research on Palparini dates back to Linnaeus (1758). In the intervening 232 years, 32 authors have described new genera, species and subspecies, but few have attempted any form of synthesis.

A chronological list of the major contributions to the systematics of Palparini, highlighting the genera and the southern African taxa, is presented in Appendix 1. These data are drawn from a catalogue of Palparini, prepared during the course of this research, which will be published at the culmination of the study.

Characters of the Palparini

The main features of the tribe Palparini were outlined by Markl (1954), the most significant being the heavily marked wings, short broad prothorax, Rs in forewings arising close to the Cu fork and the separation of Cup and tA; in the hindwings Cua curves forward acutely at its junction with the posterior branch of Mp₂ to form the recurrent vein (Fig. 43), and males all have elongated variously shaped ectoprocts.

All known larvae have a pair of sclerotized lanceolate fossorial structures, here termed the fossoria (fossorium), on the eighth abdominal segment. These are present in second and third-instar larvae, being manifest only as a pair of tubercles, each bearing a cluster of stout bristles, in first-instar larvae. Larvae of Dimarini and Palparidiini also possess fossoria, but they are bifid in *Dimares* (Stange & Miller 1990) from Argentina and *Palparidius capicola* Péringuey from South Africa. Mandibular tooth number varies from three to six and the mandibles are longer than the head. The larvae of some species attain considerable size and several are attractively marked with black, orange, red and green, often on a white background.

Three conspicuous apomorphic features may be used to distinguish this tribe: the recurrent vein in the hindwings, manifest in all Palparini and autapomorphic to the tribe, the fossoria and the increased mandibular tooth number in the larvae.

Characters for distinguishing genera in the Palparini include: morphology of the male genitalia, length of the labial palps, shapes of the terminal palpomere and sense organ and form of the legs, eyes and wings. Larval features include length of mandibles, number of teeth, head shape and biology. Genera are presently defined by a combination of characters, and the present study will attempt to identify autapomorphic features to delimit the various groups within the Palparini.

Larvae probably hold the key to the ultimate generic classification of Palparini, which may only be satisfactorily resolved once the majority of species are known as immature stages.

Species of Palparini are determined on the basis of genital structures, size, body and wing coloration and patterns, larval form and colour and biology. Wing-marking patterns remain valuable indicators of species, provided that variation in these markings is not overemphasized, as has been the tendency in the past.

Genera of Palparini

Fourteen genera were earlier included in the Palparini (Markl 1954) and Insom & Carfi (1988a) have recently added another five. Of these 19 genera, *Palpares* Rambur, 1842; *Pamecis*, *Tomatares* and *Stenares* Hagen, 1866; *Crambomorphus* McLachlan, 1867, *Tomatarella* Kimmins, 1952 and *Golafrus* Navás, 1912g are valid. The following are formally in synonymy: *Nosa* Navás, 1911b; *Palparellus* Navás, 1912d; *Pamema* Navás, 1913a; *Symmathetes* McLachlan, 1867 and *Lachlathetes* Navás, 1926a (Oswald & Penny, in press). The status of the following is uncertain: *Negretus* Navás, 1912j; *Valignanus* Navás, 1913a; *Parapalpares*, *Trichocercus*, *Goniocercus*, *Pseudopalpares* and *Indopalpares*, all Insom & Carfi, 1988a.

The status of all the above genera will be evaluated during this revision of Palparini and new genera will be established where necessary. It is premature to attempt a key at this stage because *Palpares*, as restricted by Insom & Carfi (1988a), comprises only *P. libelluloides* (Linnaeus). Its inclusion would preclude most other species currently in *Palpares*, including the majority of southern African taxa. Only once all taxa of Palparini have been studied will such a key be feasible. For the present, the genus *Palpares* is dealt with in the sense generally accepted by earlier authors. The genera proposed by Insom & Carfi (1988a) are based on very limited material and require careful re-examination together with representatives of other species-groups before their acceptance. The valid genera of southern African Palparini were included in a key by Mansell (1985).

Genus ***Pamares*** gen. nov.

Type species. *Pamares parvus* spec. nov.

Description. Small diurnal Palparini with reduced eyes, large head, spindle-shaped terminal labial palpomere with small rounded sense organ, narrow wings and body with distinctive white pilosity. A group of closely related species, apparently endemic to the Namib Desert of southwestern Africa.

Size: forewing length 24–40; hindwing 22–37; body length male: 28–48; female 22–33.

Head (Fig. 2): large, wider than thorax: vertex inflated, smoothly rounded; postgenae wide and swollen; occipital and ocular sutures distinct; face below antennae with long white pilosity. Mouthparts short, terminal labial palpomere spindle-shaped, sense organ with small round aperture (Figs 3, 4). **Eyes** characteristically reduced, surrounded by distinct ocular sclerite (Fig. 2). **Antennae** short, clavate.

Thorax: black, variously marked with yellow, bearing long white pilosity; prothorax very short, wide, with long erect white setae along margins. **Legs** short, hindlegs not extending beyond abdominal segment 3; tarsi longer than tibiae in forelegs, slightly longer or equal to tibiae in middle legs, usually shorter than tibiae in hindlegs; tibial spurs slender, slightly curved, about as long as T₁ and T₂ combined; T₁ to T₄ short, T₅ long, approximately equal to combined length of T₁–T₄; tarsal claws long slender, slightly curved. **Wings** long, narrow, banded and blotched with brown; costal area with single row of cells, costal crossveins unbranched. Forewings longer than hindwings; Rs arises on the same level or slightly distad of Cu fork; Rs branches 1, 2 and 3 run parallel to R for some distance; presectoral area with several crossveins and irregular double cells; Cu_p and 1A separate. Hindwings similar to forewings but with fewer crossveins and cells in presectoral area; Rs originates slightly proximal to fork of Mp₂; Cu_a arches strongly forward at junction with posterior branch of Mp₂, forming the typical recurrent vein; males with pilulae.

Abdomen: covered with white setae, shorter on terminal segments. **Males** with tergite 9 divided: sternite IX short with rounded apex: ectoprocts short, curved, cylindrical; gonarcus and parameres sclerotized, fused into a rigid cone-shaped structure; parameres well developed, heavily sclerotized, shiny black; a distinct median hump present anterior to parameres (Figs 6–9): hypandrium internum small, delicate, shaped as in Fig. 11. **Females** with anterior and lateral gonapophyses: pregenitale small, sclerotized: lateral gonapophyses and ectoprocts with stout fossorial spines: spermatheca dark-brown, coiled, slender, tube-like.

Larvae. Unknown.

Distribution (Fig. 42). Recorded from southwestern Africa: Namib Desert from the Cunene River in Namibia to the northern Cape Province (Richtersveld and Namaqualand) of South Africa.

Etymology. From *Pamexis* and *Palpares*. Gender: masculine.

Systematic position. *Pamares* is the sister-group of *Pamexis* with which it shares the synapomorphy of reduced eyes. It may be distinguished from *Pamexis* by the large head, narrow wings, shorter legs and white pubescence on the head, thorax and abdomen. All except one species of *Pamexis* have characteristically rounded yellow wings, tessellated with brown: there is no yellow in the wings of *Pamares*. In *Pamares*, Rs arises on the same level or slightly distad of the Cu fork in the forewings, in *Pamexis* it is proximal to the Cu fork. In *Pamares* the fore-tarsus is longer than the tibia, in *Pamexis* it is shorter. Species of *Pamares* are distinguished from *Palpares* and other Palparini by their small size and reduced eyes, these features warranting the establishment of a new genus.

Ecology and biology. All four species of *Pamares* inhabit the arid western coastal belt of southern Africa, where the rainfall is less than 125 mm per annum. They occur in a variety of biotopes including the gravel plains and sand dune areas of the Namib Desert and the sparsely vegetated sandy regions of the southern Namib.

The species are active during the day and only very few specimens have been taken at light. Biological observations have only been made on two of the species and these are discussed below.

Key to the species of *Pamares*

1	Hindwings virtually uniformly brown (fig. 15).....	<i>P. nephela</i>
	Hindwings distinctly banded or spotted.....	2
2	Thorax completely black except for two yellow spots on metanotum.....	<i>P. damarus</i>
	Prothorax, mesothorax and metathorax marked with yellow	3
3	Legs dark-brown, wings banded with brown (fig. 1)	<i>P. parvus</i>
	Legs yellow, wings lightly marked with brown (fig. 32).....	<i>P. deru</i>

Pamares parvus spec. nov., Figs 1–14, 42.

Description. Based on male holotype, 42 male and 16 female paratypes. A small species with wings heavily marked with brown blotches and bands.

Size: body length male 31.1 (28.0–37.0); body length female 24.3 (22.0–26.0); forewing male 25.9 (24.0–29.0); forewing female 27.6 (26.0–29.0); hindwing male 23.6 (22.0–26.0); hindwing female 24.5 (23.0–26.0); antenna 4.0 (3.5–5.0); holotype male: 31.0; 26.0; 23.0; 3.5.

Head: vertex and frons shiny black; face below antennae largely black; genae, clypeus and ocular sclerites yellow; a yellow stripe present between toruli and yellow along occipital suture. Maxillary and labial palps dark-brown with short white setae on labial palpomeres; white setae on face sparse, sparser on frons and vertex. *Antennae* short, scape yellow, pedicel and flagellum pitch-black.

Thorax: prothorax black with diffuse yellow markings on either side of midline, margins bearing long curved rigid white setae; pterothorax black with two yellow spots on meso- and metascutum, covered with long soft white pubescence. *Legs* black, pale at femero-tibial joint, sparsely covered with short white setae interspersed with a few black bristles, especially on tibiae. *Wings* heavily marked as depicted (Fig. 1) with at least two distinctive bands on fore- and hindwings. Forewings with 4 or 5 (occasionally 2, 3 or 6) crossveins and 0 or 1 (occasionally 2, 3 or 4) irregular double cells in presectoral area; Rs arises on same level or slightly distad of Cu fork; Rs with 6–8 (rarely 5) branches; hypostigmal cell short. Hindwings with 2 or 3 crossveins and 0 (occasionally 1) double cells in presectoral area; Rs arises proximal to fork of Mp₂; Rs with 7 or 8 (rarely 6) branches.

Abdomen: black covered with short white setae. *Male genitalia* as in genus, shaped as in Figs 5–11. *Female terminalia* as in Figs 12–14.

Distribution (Fig. 42). Recorded only from the southwestern region of Namibia and the Richtersveld of the northern Cape Province.

Etymology. Parvus (L.) – small.

Systematic position. Closely related to the next species but distinguished by its smaller size and banded hindwings. Can be separated from other species of *Pamares* by features provided in the key.

Ecology and biology. Occurs in sandy areas between the mountains of the southern Namib Desert. The area is sparsely vegetated, with the dominant plants being

Euphorbia species. Adults were observed in considerable numbers during the day but were not attracted to light. Several specimens were flying in copula, but details could not be observed.

MATERIAL EXAMINED. NAMIBIA: ♂ holotype, 40 ♂, 14 ♀ paratypes, Ac.Ne 1200, Diamond Area No. 1, Klinghardtberge, 27°19'S 15°46'E, 20–21.x.1974, M.W. Mansell; 1 ♂, 1 ♀ Paratypes, same locality, 24.x.1977, V.B. Whitehead; 1 ♂, 1 ♀ paratypes, same data but 3.x.1980. SOUTH AFRICA: Cape Province, 2 ♂, 2 ♀, (photographs only), Brandkaros, 28°28'S 16°41'E, 28.viii.1950, no collector (EMLS).

Type specimens deposited as follows: ♂ holotype, 36 ♂, 10 ♀ paratypes (SANC); 2 ♂, 2 ♀ paratypes (SAMC); 1 ♂, 1 ♀ paratypes in each of TMSA; SMWH; Naturhistorisches Museum, Vienna; Natural History Museum, London.

***Pamares nephele* spec. nov., Figs 15–21, 42.**

Description. Based on male holotype and one male paratype. A beautiful species with dark-brown wings, the hindwings being almost completely brown except at the base and a few translucent spots along the margins.

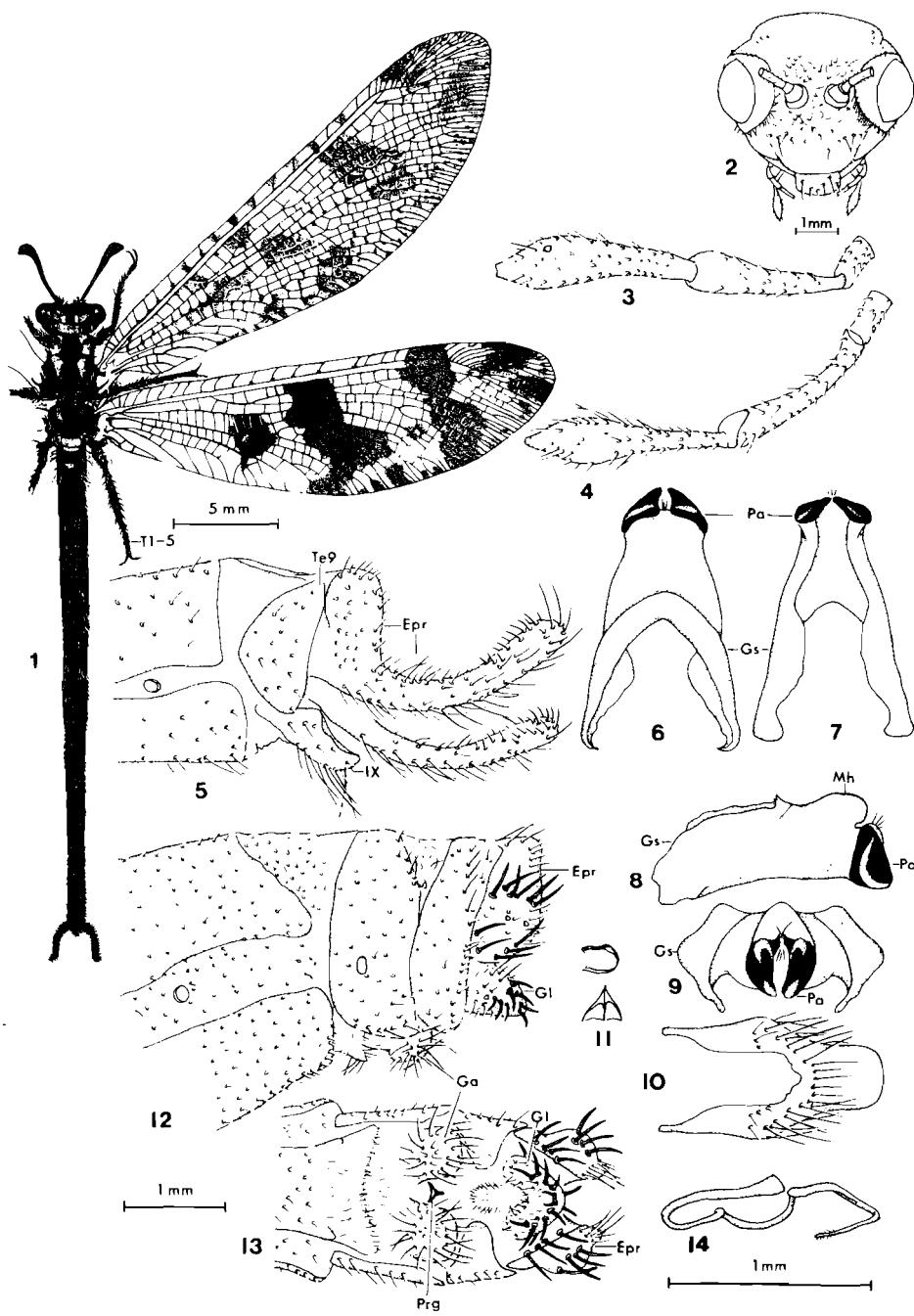
Size: length of body 39.0; forewing 31.0 (30.0–32.0); hindwing 28.5 (27.0–30.0); antenna 5.0; holotype 39.0; 30.0; 27.0; 5.0.

Head: black, ocular sclerites yellow, occiput with diffuse yellow markings; face below antennae yellow with two large brown marks, genae yellowish-brown, post-genae brown. Maxillary and labial palps dark-brown; frons and face below antennae with sparse long white setae, vertex with very sparse white setae. **Antennae** pitch-black with yellow ring at apex of pedicel, scape with long white setae.

Thorax: prothorax black with two large yellow spots encircling a black spot on either side, margins with long curved rigid white and black setae; pterothorax black with a pair of yellow stripes on meso- and metanota, all covered with sparse black and white pilosity; pleurites and sternites black with long white pilosity. **Legs** black, covered with long and short white bristles with some black bristles ventrally on femora and tibia; fore-tarsi with dense golden pubescence; tibial spurs and tarsal claws dark-brown. **Wings** (Fig. 15) heavily infuscated, especially the hindwings which are almost completely brown. Forewings with yellowish venation, but R and Cu brown proximally, three brown bands present, proximal band narrow outer two broad; presectoral area with 4 crossveins and 1 irregular double cell; Rs arises on same level or slightly distal to Cu fork; Rs with 6 or 7 branches; hypostigmal cell short. Hindwing with 2 to 4 presectoral crossveins and no cells; Rs slightly before fork of Mp₂; Rs with 7 or 8 branches; hypostigmal cell short.

Abdomen: black with sparse short white setae. **Male** ectoprocts short, brown, genitalia otherwise as in genus, shaped as in Figs 16–21. **Female** unknown.

Figs 1–14. *Pamares parvus* sp. nov. (paratype ♂, Klinghardtberge). 1: habitus, male. 2: head. 3: labial palp, lateral showing sense organ. 4: labial palp, dorsal depicting shape. 5: male, external terminalia, lateral. 6: gonarcus/paramere complex, dorsal. 7: same, ventral. 8: same, lateral. 9: same, caudal. 10: sternite IX, ventral. 11: hypandrium internum, lateral and dorsal. 12: female, external terminalia, lateral. 13: same, ventral. 14: spermatheca. Abbreviations: Epr, ectoproct; Ga, anterior gonapophyses; Gl, lateral gonapophyses; Gs, gonarcus; Mh, median hump; Pa, paramere; Prg, pregenitale; T₁–5, tarsomeres; Teg, tergite 9; IX, sternite 9.



Distribution (Fig. 42). Known from only one locality in Namaqualand, north-western Cape Province.

Etymology. Gr. – nephele, a cloud. From the type locality Grootmis (great mist). Also referring to the infuscated hindwings.

Systematic position. This species resembles *P. parvus*, to which it is closely related. The two species may be distinguished as outlined under *P. parvus* and they can be separated from the two other species of *Pamares* by features provided in the key.

Ecology and biology. Unknown.

MATERIAL EXAMINED. SOUTH AFRICA: *Cape Province*, ♂ holotype, 1 ♂ paratype, Ac.NE 1201, near Grootmis, $29^{\circ}40'S$ $17^{\circ}06'E$, 17.xii.1974, I. Bampton (SANC).

***Pamares damarus* spec. nov., Figs 22–31, 42.**

Description. Based on male holotype, seven male and nine female paratypes. Characterized by black thorax with two yellow spots only on metanotum, forewings with sparse small brown marks and hindwings with dark-brown spots sometimes coalesced into two bands.

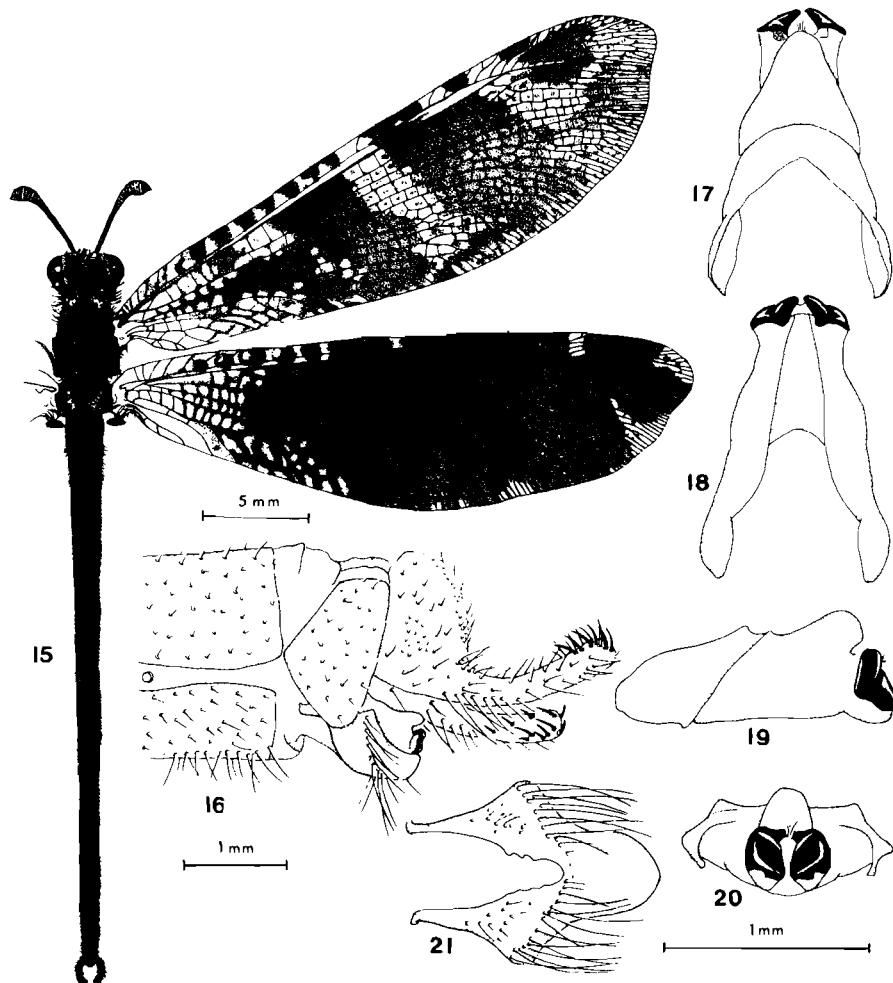
Size: length of body male 45.7 (42.0–48.0); length of body female 29.1 (26.0–31.0); forewing male 32.5 (30.0–34.0); forewing female 32.6 (29.0–37.0); hindwing male 29.8 (27.0–32.0); hindwing female 30.1 (25.0–34.0); antenna 5.0 (4.5–6.5); holotype male: 43.0; 32.0; 30.0; 5.0.

Head: large, yellow, vertex shiny black, the black extending in a median stripe to occiput, frons above antennae dull black; ocular sclerites, genae, post-genae, face below antennae, clypeus and labrum all pale-yellow. Maxillary and labial palps dark-brown; frons with sparse white pilosity, vertex and face below antennae almost devoid of hair. *Antennae* completely black with long white setae on scape.

Thorax: entirely black except for two small yellow spots on metanotum; prothorax occasionally with two pale patches on anterior and posterior margins; margins of prothorax with long curved rigid white setae; pleurites and sternites black; whole thorax covered with long soft white pubescence. *Legs* dark-brown, paler at joints, covered with short and long white bristles especially on femora; tibial spurs and tarsal claws reddish-brown. *Wings* (Fig. 22) with pale yellowish-orange venation. Forewings with a few small brown spots; presectoral area with 3, 4 or 5 (rarely 2 or 6) crossveins and 0 or 1 (occasionally 2 or 3) irregular double cells; *Rs* arises slightly beyond Cu fork; *Rs* with 8 (occasionally 7 or 9) branches; hypostigmal cell long relative to other *Pamares* species. Hindwings with sparse dark-brown spots or bands; presectoral area with 2 or 3 (occasionally 4) crossveins and 0 (occasionally 1) irregular double cells; *Rs* arises before the fork of *Mp₂*; *Rs* with 8 or 9 (rarely 7 or 10) branches.

Abdomen: segments 1 and 2 black, tergites 3 to 6 yellow, 7 and 8 black with elongated yellow patch dorsally, 9 black; sternites and pleurites black; abdomen sparsely covered with short white setae dorsally and black setae ventrally. *Male* ectoprocts black; genitalia as in genus, shaped as in Figs 23–28; sternite IX very broad. *Female* as in Figs 29–31.

Distribution (Fig. 42). Northern Namib Desert from the Cunene River to the Awasib Mountains in the southern Namib. The most widespread of the four *Pamares* species.



Figs 15–21. *Pamares nephele* sp. nov. (holotype ♂). 15: habitus, male. 16: male, external terminalia, lateral. 17: gonarcus/paramere complex, dorsal. 18: same, ventral. 19: same, lateral. 20: same, caudal. 21: sternite IX, ventral. Structures as in Figs 5–13.

Etymology. From Damaraland, the main distributional area of this species.

Systematic position. This species is probably most closely related to the next taxon. Their ranges overlap in the area near the Namib Desert Research Station at Gobabeb. It is easily distinguished from other species of *Pamares* by the sparsely marked forewings and the virtually black thorax.

Ecology and biology. Unknown.

MATERIAL EXAMINED. NAMIBIA: ♂ holotype, 4 ♀ paratypes, Ac.NE 350, Hartmans Mountains at Cunene River, 17°16'S 12°12'E, 6.iv.1984, S. Braine (SANC); 1 ♂ paratype, Ac.NE 1202, Namib/Naukluft Park, Langer Heinrich, 22°47'S 15°20'E, 6.iii.1976, S. Braine (SANC); 1 ♂, 1 ♀ paratypes, Ac.NE 1203, Namib/Naukluft Park, Namib Plain, W Tsondabvlei, 23°50'S 15°15'E, 28.iv.1969, H.D. Brown (SANC); 1 ♀ paratype, Ac.NE 1204, Awasib Mountains, southern Namib, 25°30'S 15°40'E, 13.v.1969, H.D. Brown (SANC); 1 ♂ paratype, Ac.NE 1205, Damaraland, Springbokwasser, 20°20'S 13°32'E, iii.1985, S. Braine (SANC); 1 ♂ paratype, Ac.NE 1206, Skeleton Coast, 17.12Ca, 6.iv.1986, E. Holm & E. Marais (SANC); 1 ♀ paratype, Gobabeb, Game Res No 3, [23°34'S 15°03'E], 12-17.iv.1967, J.H. Potgieter (TMSA); 3 ♂, 2 ♀ paratypes, Twyfelfontein, [20°33'S 14°22'E], 1.v.1968, F. Gaerdes (1 ♂, 1 ♀ SMWH; 2 ♂, 1 ♀ EMLS); 1 ♀ (not a paratype), No I 1594, Namib Desert, Homeb, 23°39'S 15°10'E, 29.iv.1982, "10.30", L. Praetorius (Gobabeb Coll.).

Pamares deru spec. nov., Figs 32-41, 42.

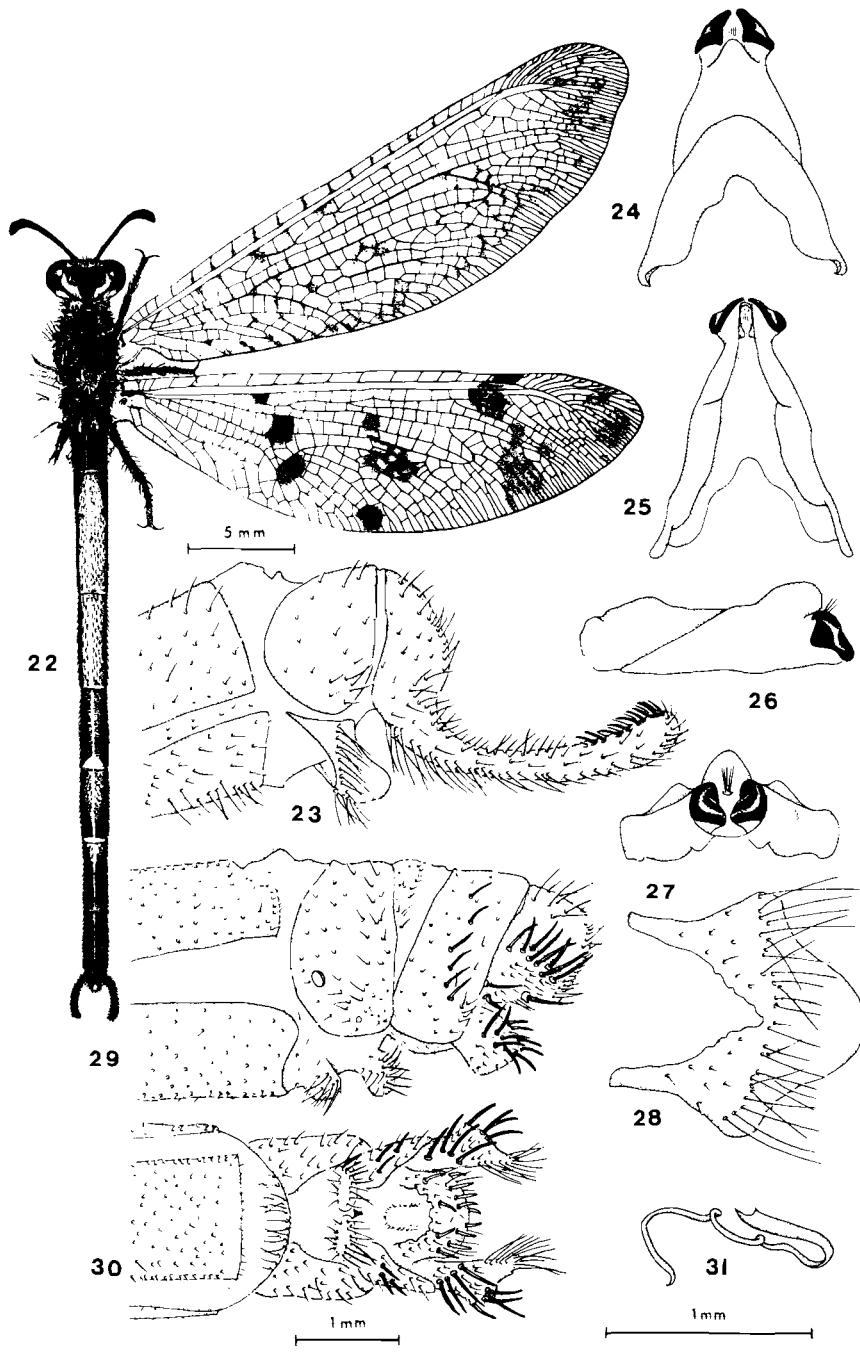
Description. Based on male holotype, four male and eight female paratypes. A beautiful species with lightly marked forewings, hindwings with dark-brown bands; thorax largely marked with yellow and yellow legs.

Size: body length male 39.7 (38.0-41.0); body length female 29.8 (29.0-33.0); forewing male 33.2 (32.0-36.0); forewing female 37.1 (33.0-40.0); hindwing male 30.0 (28.0-32.0); hindwing female 33.8 (30.0-37.0); antenna 6.0 (5.0-7.0); holotype male: 38.0; 33.0; 30.0; 5.0.

Head: yellow, frons black, vertex and occiput diffusely marked with brown, ocular sclerites and face below antennae yellow; genae, clypeus, labrum all pale-yellow. Maxillary and labial palps yellowish-orange; frons and face below antennae densely covered with long white pilosity; vertex with short sparse white hair. *Antennae* with scape yellow, pedicel and flagellum yellowish-brown, pedicel with long white setae.

Thorax: prothorax with raised margins yellow, black centrally with a longitudinal black stripe along midline; margins bearing long curved rigid white setae: pterothorax black with large yellow patches on all tergites as depicted; metascutellum black with yellow margins; all covered with sparse white pubescence; pleurites and sternites largely black with white pubescence. *Legs* yellow, femora brown on anterior surfaces; legs covered with short white setae interspersed with longer white bristles,

Figs 22-31. *Pamares damarus* sp. nov. (paratype ♂, Hartman's Mountains). 22: habitus, male. 23: male, external terminalia, lateral. 24: gonarcus/paramere complex, dorsal. 25: same, ventral. 26: same, lateral. 27: same, caudal. 28: sternite IX, ventral. 29: female external terminalia, lateral. 30: same, ventral. 31: spermatheca. Structures as in Figs 5-13.



especially on femora; tibial spurs and tarsal claws light-brown, very slender. *Wings* (Fig. 32): forewings with veins pale-yellow but brown within the wing-markings, costal veinlets brown, C alternating yellow and brown; Cu brown up to Cu fork, imparting a distinct Y-shaped brown mark; presectoral area with 4–6 (rarely 2) crossveins and 1 or 2 (rarely 0 or 3) irregular double cells; Rs arises slightly distad of Cu fork; Rs with 8 (occasionally 7 or 9) branches; hypostigmal cell short. Hindwings distinctly pink in living specimens with a large dark-brown spot over Cu fork and two bands (sometimes disrupted) in middle region of wing; wing tip brown; presectoral area with 3 (occasionally 2 or 4) crossveins and 0 or 1 irregular double cells; Rs arises proximal to fork of Mp₂; Rs with 8 or 9 (occasionally 7 or 10) branches.

Abdomen: segments 1 to 3 and all sternites dark-brown; tergites 4 to 9 yellow with black stripes along pleurites; densely covered with short white setae, longer on proximal segments. *Male* ectoprocts yellow, genitalia as in genus, shaped as in Figs 33–38. *Female* as in 39–41.

Distribution (Fig. 42). Known only from the sand dune desert in the immediate vicinity of the Namib Desert Research Station at Gobabeb.

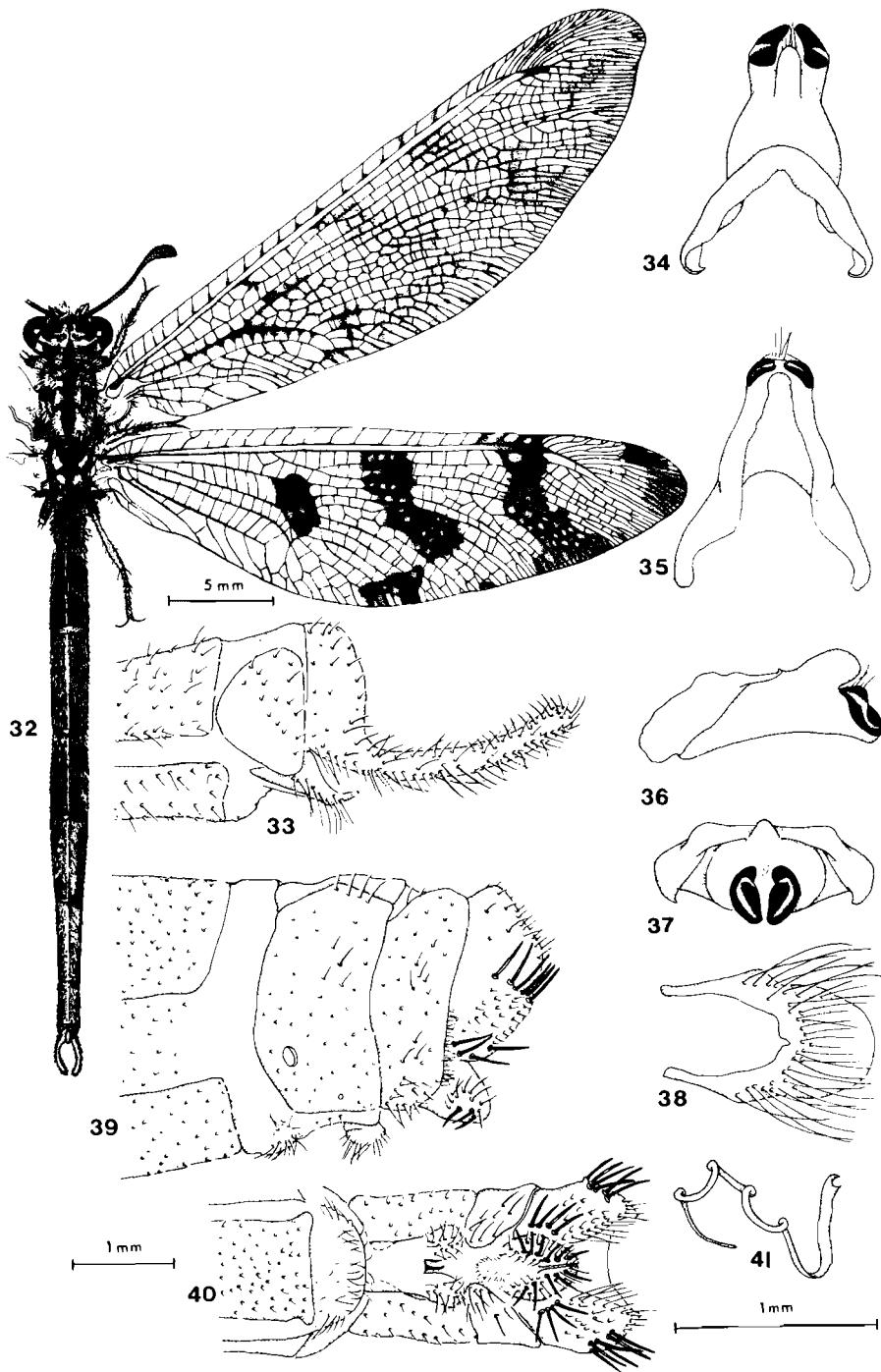
Etymology. Acronym of the Desert Ecological Research Unit at Gobabeb, the type locality.

Systematic position. Is probably most closely related to *P. damarus*. It may be distinguished from the other three species of *Pamares* by its yellow legs and the extensive yellow markings on the thorax.

Ecology and biology. *Pamares deru* inhabits the sand dunes immediately to the south of the Kuiseb River and exhibits a remarkable evasive flight pattern. When flushed, the insect flies rapidly upwards, the pinkish-red hindwings providing a distinctive flash pattern reminiscent of species of *Acrotalus* (Orthoptera: Acrididae). It utilizes the wind to carry it for some distance before dropping down to fly inconspicuously in the air current a few centimetres above the sand. A few metres are traversed in this manner before the insect alights on a small prominence such as a pebble, stone or grass stem. The wings are then closed immediately rendering it highly cryptic. Although largely diurnal, a few specimens have been taken at the laboratory lights of the Research Station.

MATERIAL EXAMINED. NAMIBIA: ♂ holotype, 1 ♂, 2 ♀ paratypes, Namib/Naukluft Park, Dunes near Gobabeb, 23°34'S 15°03'E, 6.iii.1983, M.W. Mansell; 1 ♂ paratype, same data but R. Oberprieler; 1 ♀ paratype, same data but 15.iii.1983, R. Oberprieler; 1 ♂ paratype, same data but swept from *Eragrostis spinosa* (Poaceae) in Kuiseb River bed, all Ac.NE 93 (SANC); 1 ♂, 1 ♀ paratypes, Namib Desert Park, 5 km S Homeb, 23°15'C, 450M, 13.ii.1974, M.K. Seely, "open dunes in rain gauges" (LASC); 1 ♀ paratype, No. I 1376, Gobabeb, 23°34'S 15°03'E, 31.iii.1981, L. Praetorius, "Station in lab." ; 1 ♀ paratype, No. I 1237, same data but 8.iv.1981, "Station light"; 1 ♀ paratype, No. I 1664, same data but 15.iii.1982, "Station light" (2 in SMWH; 1 in Gobabeb coll.).

Figs 32–41. *Pamares deru* sp. nov. (holotype ♂). 32: habitus, male. 33: male, external terminalia, lateral. 34: gonarcus/paramere complex, dorsal. 35: same, ventral. 36: same, lateral. 37: same, caudal. 38: sternite IX, ventral. 39: female external terminalia, lateral. 40: same, ventral. 41: spermatheca. Structures as in Figs 5–13.



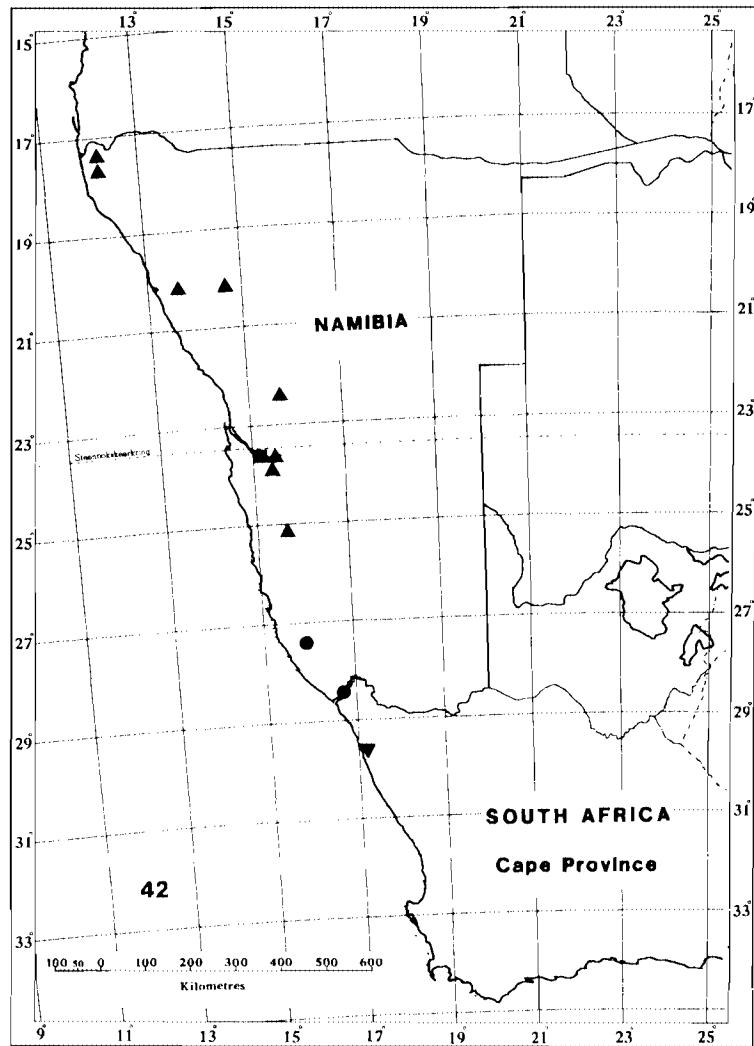


Fig. 42. Recorded distribution of *Pamares* gen. nov. Circles - *Pamares parvus* sp. nov. (2 records); inverted triangle - *P. nephele* sp. nov. (1 record); triangles - *P. damarus* sp. nov. (8 records); square - *P. deru* sp. nov. (1 record).

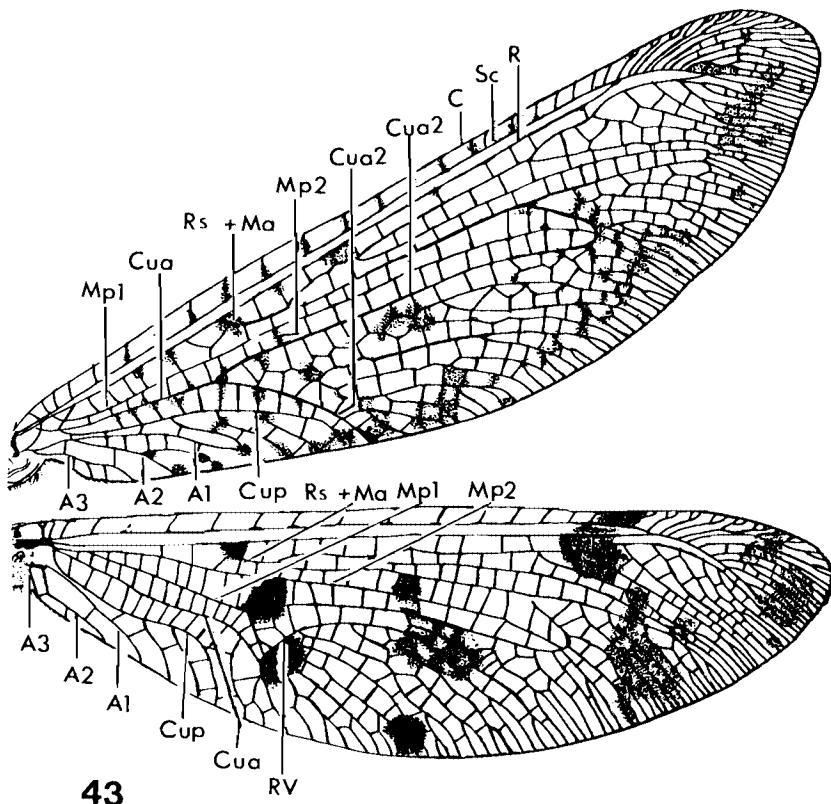


Fig. 43. Wings of *Pamares damarus* sp. nov. depicting main wing veins. Abbreviations: A₁–A₃, anal veins; C, costa; Cu_a, anterior cubitus; Cu_p, posterior cubitus; Ma, anterior median; Mp, posterior median; R, radius; Rs, radial sector; RV, recurrent vein; Sc, subcosta.

APPENDIX 1

Chronological list of the major contributions to the systematics of Palparini

Original names are cited with present status in brackets.

Author	Date	Contribution
Linnaeus	1758	<i>Hemerobius speciosum</i> (<i>Palpares speciosus</i>), the first documented palparine.
Linnaeus	1764	<i>Hemerobius libelluloides</i> , from Europe, later designated by Banks (1911) as type species of <i>Palpares</i> Rambur, 1842.
De Geer	1773	<i>Myrmeleon maculatum</i> (<i>Palpares speciosus</i>).
Fabricius	1781	The first Oriental species.
Thunberg	1784	<i>Myrmeleon luteum</i> (<i>Pamecis luteus</i>).

Author	Date	Contribution
Illiger	1790	A species from Asia Minor.
Olivier	1811	<i>Myrmeleon sinuatum</i> (<i>Crambomorphus sinuatus</i>), <i>M. bifasciatum</i> (<i>Palpares bifasciatus</i>).
Latreille	1817	The second Oriental taxon.
Dalman	1823	<i>M. leopardus</i> (<i>P. speciosus</i>) and three other species.
Klug	1834	Three species from Senegal.
Westwood	1837	An Afrotropical species.
Guérin-Méneville	1838	A species from Senegal.
Burmeister	1839	<i>Myrmecoleon pardalinus</i> , <i>M. conspurcatus</i> , <i>M. venosus</i> (all to be synonymized in <i>Pamegis</i>): named <i>M. caffer</i> without description; listed <i>M. maculatum</i> , <i>M. leopardus</i> as synonyms of <i>M. speciosus</i> .
Rambur	1842	Genus <i>Palpares</i> : listed 19 species, 9 new: no new species from southern Africa.
Walker	1853	<i>Myrmeleon inclemens</i> (<i>Palpares</i>), <i>M. translatus</i> (<i>Pamegis</i>): discussed 37 species, 12 new: ignored <i>Palpares</i> , placing all species in <i>Myrmeleon</i> Linnaeus.
Hagen	1853	<i>Palpares citrinus</i> (<i>Tomatares</i>), <i>P. moestus</i> (<i>Lachlathetes</i>), <i>P. tristis</i> .
Kolenati	1856	A species from Europe.
Walker	1860	A species from India.
Hagen	1860a	A species from Spain: synonymy of species described by Illiger (1790) and Kolenati (1856).
Hagen	1860b	Arranged species into groups, but did not propose genera. The first attempt at synthesis in the Palparini.
Hagen	1862	Discussed several southern African taxa: no new species.
Gerstaecker	1863	<i>Palpares haematogaster</i> (<i>Crambomorphus</i>), and a species from Sri Lanka.
Hagen	1866	<i>Tomatares</i> , <i>Pamegis</i> , <i>Stenares</i> : named <i>Palpares comes</i> , <i>P. conspurcatus</i> , both <i>nomina nuda</i> : a fundamental work on Neuroptera, cataloging all described taxa and assigning them to their correct genera.
McLachlan	1867	<i>Crambomorphus</i> , <i>Symmathetes</i> (<i>Lachlathetes</i> Navás): <i>Palpares immensus</i> , <i>P. sparsus</i> , <i>P. damarensis</i> , <i>P. brachypterus</i> , <i>P. flavofasciatus</i> plus two others: synonymy of several species described by Walker (1853).
Brauer	1867	Discussed <i>M. sinuatum</i> Olivier (<i>Crambomorphus sinuatus</i>).
McLachlan	1873	Discussed species described by Rambur (1842).
Taschenberg	1879	First complete description of <i>P. caffer</i> (Burmeister): discussed several Afrotropical species including <i>P. speciosus</i> (Linnaeus), <i>P. pardalinus</i> (Burmeister).
Hagen	1887	Important notes on southern African taxa.
Gerstaecker	1888	Two Afrotropical species: discussion of others.
Gerstaecker	1894	<i>Palpares festivus</i> and three other Afrotropical species.
McLachlan	1894a	A species from Madagascar.
McLachlan	1894b	A species from Saudi Arabia.
McLachlan	1898	A species and subspecies from Algeria.
Kolbe	1898a	Four Afrotropical species, two varieties.
Kolbe	1898b	Five Afrotropical species.
Van der Weele	1903	Rediscovered the types of <i>M. sinuatum</i> , <i>M. bifasciatum</i> Olivier (<i>Crambomorphus sinuatus</i> , <i>Palpares bifasciatus</i>): provided important data on them.
Kolbe	1906	Three species from Madagascar.

Author	Date	Contribution
Schmidt	1907	A species from Zaire.
Van der Weele	1907a	Four species from Madagascar: notes on others.
Van der Weele	1907b	A species from Uganda.
Van der Weele	1908	Discussed species described by Gerstaeker.
Needham	1909	Listed the Indian taxa.
Kirby	1909	A species from Uganda.
Péringuay	1910	<i>Palpares cataractae</i> , <i>P. mosambicus</i> , <i>P. karrooanus</i> , <i>P. elegantulus</i> , <i>P. genialis</i> , <i>P. ovampoanus</i> , <i>P. dubiosus</i> .
Péringuay	1911	<i>P. aemulus</i> , <i>P. sobrinus</i> , <i>P. oneili</i> (<i>Golafrus</i>): hitherto the only local systematist to describe Afrotropical Myrmeleontidae.
Navás	1911–1936	<i>Nosa</i> , <i>Palparellus</i> (<i>Palpares</i>), <i>Golafrus</i> , <i>Negretus</i> , <i>Pamema</i> (<i>Pamexis</i>), <i>Valignanus</i> . Also described 69 species and 17 subspecies, mostly from the Afrotropical Region, including <i>Palpares varius</i> , <i>P. nyassanus</i> , <i>P. compositus</i> , <i>P. extensus</i> , <i>P. latus</i> , <i>P. torridus</i> , <i>P. mistus</i> , <i>P. roratus</i> , <i>P. excelsus</i> , <i>P. campanai</i> , <i>P. carpentieri</i> , <i>P. gratiosus</i> , <i>P. caffer audeoudi</i> , <i>P. moestus joannisi</i> , <i>P. speciosus capensis</i> , <i>Pamema insperatus</i> , occurring in southern Africa. Navás' works have complicated research on Palparini as most of his taxa are synonyms, but require careful evaluation. All papers which include Palparini are cited in the reference list.
Banks	1911a	<i>Palpares formosus</i> : first keys to species: designated <i>Palpares</i> (!) <i>libelluloides</i> (Linnaeus) as type species of <i>Palpares</i> Rambur: erected tribe Palparini.
Banks	1911b	A variety from India.
Banks	1913	Revision of genus <i>Palpares</i> including key: of fundamental importance to research on Palparini and hitherto the only significant attempt to evaluate the species.
Stitz	1912	<i>Palpares formosus bifasciatus</i> , <i>P. annulatus</i> , <i>P. kalahariensis</i> , <i>Tomatates guttatus</i> : three other Afrotropical species and five varieties.
Banks	1915	A new Afrotropical species.
Esben-Petersen	1916	Important discussion on Palparini.
Esben-Petersen	1918	Proposed the Archaeomyrmeleonidae, comprising <i>Palpares</i> and related genera, which he considered the more primitive Myrmeleontidae.
Esben-Petersen	1920	Discussed some of Navás' species in the Vienna Museum.
Esben-Petersen	1922	<i>Palpares pulchellus</i> and a species from Malawi.
Esben-Petersen	1925	A species from Madagascar.
Esben-Petersen	1928a	Discussed southern African species: an important contribution to knowledge of the local Palparini.
Esben-Petersen	1928b	Brief discussion.
Esben-Petersen	1931	Discussed three species.
Banks	1920	Listed species from Zaire.
Banks	1927	Subfamily Palparinae.
Banks	1930	A subspecies from Liberia.
Banks	1931	A species from India.
Fraser	1950	A species from Niger.
Fraser	1951	Two species from Madagascar: discussion.
Kimmins	1952	<i>Tomatarella</i> from Saudi Arabia.
Markl	1954	First precise definition of the tribe Palparini: listed all the genera, including synonyms. One of the most important works on Palparini.

Author	Date	Contribution
Handschin & Markl	1955	Notes on Angolan species.
Hölzel	1972	Outlined tribes in the subfamily Palparinae; listed five species with synonyms; key to the taxa of the Middle East (Anterior Asia).
Koçak	1976	A subspecies from Turkey.
Aspöck <i>et al.</i>	1980	Detailed account of <i>Palpares libelluloides</i> , with synonyms; provided synopsis of literature on this Palaearctic species.
Hölzel	1982	Discussed seven species, two genera from Saudi Arabia.
Hölzel	1986	Included four tribes in subfamily Palparinae; discussion of zoogeography of Palaeartic Myrmeleontidae.
Monserrat	1984	Recorded Navás' type specimens in Barcelona Museum.
Hölzel	1988	A species from Saudi Arabia.
Ghosh	1984	Synopsis of Indian species.
Insom & Carfi	1988a	<i>Parapalpares</i> , <i>Trichocercus</i> , <i>Goniocercus</i> , <i>Pseudopalpares</i> , <i>Indopalpares</i> after studying only 12 of the possible 100 taxa of Palparini.
Insom & Carfi	1988b	<i>Parapalpares</i> and a new species from Ethiopia.
Stange & Miller	1990	Listed known larvae of Palparini.

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